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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/699,975	11/02/2003	Isaiah O. Oladeji	Jessen 7-1-4/(284)	5032

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EXAMINER	
GUERRERO, MARIA F	

ART UNIT	PAPER NUMBER
2822	

DATE MAILED: 04/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/699,975	OLADEJI ET AL.	
	Examiner	Art Unit	
	Maria Guerrero	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *6-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *6-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This Office Action is in response to the Preliminary Amendment filed January 30, 2004.

Status of Claims

2. Claims 1-5 are canceled. Claims 6-24 are pending.

Claim Objections

3. Claim 17 is objected to because of the following informalities: the term "carbide" is misspelled. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 6-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al. (U.S. 6,312,874) in view of Usami (U.S. 6,468,898).

Chan et al. teaches a method of forming a dual damascene interconnect structure having a low-K dielectric material deposited over an underlying metal layer (Fig. 3a, Abstract). Chan et al. discloses forming a tri-part mask layer (58) overlaying the low-K dielectric material. Chan et al. shows the tri-part mask layer including: a

passivation mask film (52) (silicon oxide) on the low-K dielectric material (50), a non-metallic barrier mask film (54) made of silicon nitride on the first mask layer (52) (col. 5, lines 10-15), and third layer (56) overlaying the barrier mask film (54).

In addition, Chan et al. teaches the low-k dielectric material is still protected by the first mask layer (52) and the multiple layer mask (58) (Abstract, Fig. 3c-3e). Chan et al. teaches etching each mask layer selectively without etching the rest of the layers and selectively etching the low-k dielectric material (Fig. 3a-3e, col. 5, lines 45-67, col. 6, lines 5-25). Chan et al. teaches etching a trench with the mask layer and after etching the trench and before transferring the trench to the then etching a low-k dielectric material, etching a via through the mask layer within the trench and through the low-k dielectric material to the underlying metal layer (Abstract, Fig. 3a-3i, 4a-h).

Furthermore, Chan et al. teaches etching a first feature on the mask layer without exposing the dielectric material, etching a second feature on the mask layer without exposing the dielectric layer (Fig. 3a-3e). Chan et al. discloses transferring the first and second features to the dielectric layer and etching the dielectric layer (Fig. 3e-3i). Chan et al. shows depositing a conductive metal in the first and second features, planarizing the conductive metal and removing the mask (Fig. 3j, col. 6, lines 50-67).

Chan et al. does not specifically show forming the metallic mask film over the barrier mask film. However, Usami discloses forming a silicon dioxide film (or silicon carbide) (24) over the low-K dielectric material (23), forming a mask (35) (barrier mask film), forming a metallic mask film (37) over the mask (35) (Fig. 4A, col. 9, lines 62-67, col. 10, lines 5-22).

Usami shows the metallic mask film comprising: titanium, tantalum, tungsten, titanium nitride, and tantalum nitride (col. 5, lines 45-49). Usami discloses the first and second metal masks are stacked together to form the metal mask (Fig. 4C, col. 10, lines 15-22). Usami depositing a conductive metal within the via and the trench on the low-k dielectric material (Fig. 6A, col. 11, lines 53-60). In addition, Usami shows planarizing the conductive metal and removing the mask (Fig. 6A-6B, col. 11, lines 57-65).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Chan et al. reference by specifying the use of the metallic mask film as part of the mask layer as taught Usami in order to provide a good quality dual damascene structure using a multiple layer mask ensuring the protection of the low dielectric constant material during the photoresist removal process and the via would maintain desired width minimizing misalignment. The combination is proper because both references are solving a common problem (Usami, col. 3, lines 64-67; Chan et al., Abstract, col. 3, lines 64-67).

Conclusion

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maria Guerrero whose telephone number is 571-272-1837.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 571-272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

April 11, 2005

María Guerrero

MARIA F. GUERRERO
PRIMARY EXAMINER